REMARKS

The present invention is a method of determining a thermal profile of a drilling fluid circulating in a well during drilling. The method comprises the steps of a) determining an expression $\theta 1$ of a thermal profile of the drilling fluid inside the drill string in the well and a expression $\theta 2$ of a thermal profile of the drilling fluid in an annulus surrounding the drill string, using a heat propagation equation accounting for a thermal profile of a medium surrounding the well; b) measuring a temperature T1 of the drilling fluid at a well inlet, a temperature T2 at a bottom of the well, and a temperature T3 at a well outlet; and wherein c) the expressions $\theta 1$ and $\theta 2$ meet temperature boundary conditions of T1, T2 and T3. The method permits a real-time determination of the thermal profile of the drilling fluid. See paragraph [0002] of the Substitute Specification.

Submitted herewith is a certified copy of the French Application on which priority is claimed.

The Examiner states that in paragraph 3 that claims 19 and 20 are rejected under the second paragraph of 35 U.S.C. §112. However, nothing is stated in the record identifying what the grounds of rejection are. Accordingly, it is assumed that the inclusion of paragraph 3 without the discussion of what is indefinite is indicative of the fact that paragraph 3 was included erroneously. However, if the Examiner has any grounds for rejection under the second paragraph of 35 U.S.C. §112 of claims 19 and 20, it is requested that he complete the record on this point.

Claims 19 and 20 stand rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which the Examiner says is not properly described.

Specifically, with respect to claim 19, the Examiner states that the specification doesn't teach how pressure drops can be calculated and with respect to claim 20, the Examiner states, the specification states that hydrate formation can be predicted but doesn't teach how. With respect to the rejection of claim 19, enclosed is French Patent 2,801,996 and the corresponding British Patent 2,364,804 of the Assignee which involve fluid circuit pressure drop calculation. It is submitted that these patents show that prior to the filing date of the present invention that methods of calculating pressure drop by taking a temperature profile into account were known. Similarly, the enclosed publication, "Drilling Muds for Deepwater: Hydrates and Rheology Problems" teach the relation between hydrate formation and temperature which provides a basis for a person of ordinary skill in the art to calculate the hydrates formation zones of claim 20. Accordingly, it is submitted that a person of ordinary skill in the art also possessed sufficient information prior to the filing date of the present application that provided the ability to possess the subject matter of claims 19 and 20 without undue experimentation.

Claims 11-18 stand rejected under 35 U.S.C. §102 as being anticipated by the Hasan et al SPE 17848 Publication. The rejection is traversed for the following reasons.

Independent claim 11 defines a method of determining a thermal profile of a drilling fluid circulating in a well during drilling comprising the steps:

a) determining an expression $\theta 1$ of a thermal profile of the drilling fluid inside the drill string in the well and a expression $\theta 2$ of a thermal profile of the drilling fluid in an annulus surrounding the drill string, using a heat propagation equation accounting for a thermal profile of a medium surrounding the well;

b) measuring a temperature T1 of the drilling fluid at a well inlet, a temperature T2 at a bottom of the well, and a temperature T3 at a well outlet; and wherein

c) the expressions $\theta 1$ and $\theta 2$ meet temperature boundary conditions of T1, T2 and T3.

With the invention, the thermal profile is determined by the determining of expressions of a thermal profile of a drilling fluid inside the drill string in the well and a thermal profile of the drilling fluid in an annulus surrounding the drill string and using a heat propagation equation accounting for a thermal profile of a medium surrounding the well. Thereafter, actual temperature measurements T1 of the drilling fluid at the well inlet, temperature T2 at a bottom of the well and temperature T3 at a well outlet are measured followed by the determined expressions meeting the temperature boundary conditions of T1, T2 and T3.

Hasan et al provides an analytical model of a circulating fluid temperature in a tank and tubing as a function of circulation time and well depth as illustrated in Fig. 1. Measurement of temperatures T1, T2 and T3 is not disclosed. Heat transfer in the annulus and the tubing is modelled in accordance with equations 5 and 6. See column 1 under the heading "Mathematical Development" on page 134 extending through column 2. Nowhere is there any discussion of the claimed temperature measurements nor the use thereof for having expressions $\theta 1$ and $\theta 2$ meeting the temperature boundary conditions as recited in claim 11. If the Examiner persists in the stated grounds of rejection, it is requested that he indicate how each of the limitations of claim 11 is met in Hasan et al which, as pointed out above, is an analytical modelling technique not based upon measurements of temperatures in the

drilling fluid at the well inlet, the bottom of the well and the well outlet and does not provide for expressions meeting the temperature conditions T1, T2 and T3.

With the present invention at any instance in time based upon the measurements, the temperature profile may be determined. In contrast, in accordance with Hasan et al, the temperature profile is estimated using the model at any point in time without any temperature measurements. Moreover, the present invention's reliance upon real measurements is based upon actual well information which permits prediction of the temperature profile in the flowing mud of a well.

The dependent claims 12-18 and newly submitted claims 21-46 further recite more specific aspects of the present invention which are not anticipated by Hasan et al in view of the fundamental difference of Hasan et al being based upon analytical modelling techniques without temperature measurement whereas the present invention is based upon actual measurement of temperature information in a well.

In view of the foregoing amendments and remarks, it is submitted that each of the claims in the application is in condition for allowance. Accordingly, early allowance thereof is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1.136. Please charge any shortage in fees due in connection with the

filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (612.40801X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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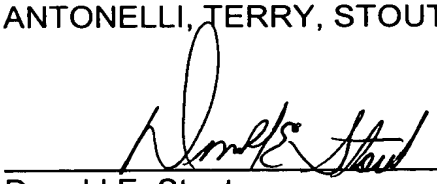

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Attachments

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